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Heavy Crude Oil In Situ Thermal Recovery
Report, Peace River, Alberta. 1
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HEAVY CRUDE OIL IN SITU THERMAL RECOVERY REPORT

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SHELL CANADA LIMITED
IN SITU THERMAL RECOVERY PROJECT
PEACE RIVER, ALTA.

The following report is submitted on the Shell Canada Limited project being undertaken in the Peace River area, making use of an in situ thermal recovery method to produce heavy crude oil.

HEAVY CRUDE

Western Canada holds the greatest known reserves of heavy crudes and tar in the world. These are locked in Lower Cretacious sands along a broad belt stretching for five hundred miles from the Peace River Oil Sands in Northwestern Alberta to the Lloydminster district on the Alberta-Saskatchewan border. Large deposits are located in the Wabasca, Harmon Valley and Cold Lake areas. These reserves cannot be developed by conventional oilfield production techniques, but by a method which will result in thinning the viscous oil to a state in which it can be more readily produced. Injection of steam, and the sweep of a slowly moving fire front, are the most popular methods today.

In the past, production, transportation and refining difficulties have prevented the marketing of these heavy crudes in important quantities. However, this too is changing. For several years heavy crude oil has been blended with light crudes and transported to Ontario by pipeline. Viscosity may also be reduced by blending with condensate - a liquid by-product of natural gas - to facilitate transportation and handling. New refining methods have also been developed.

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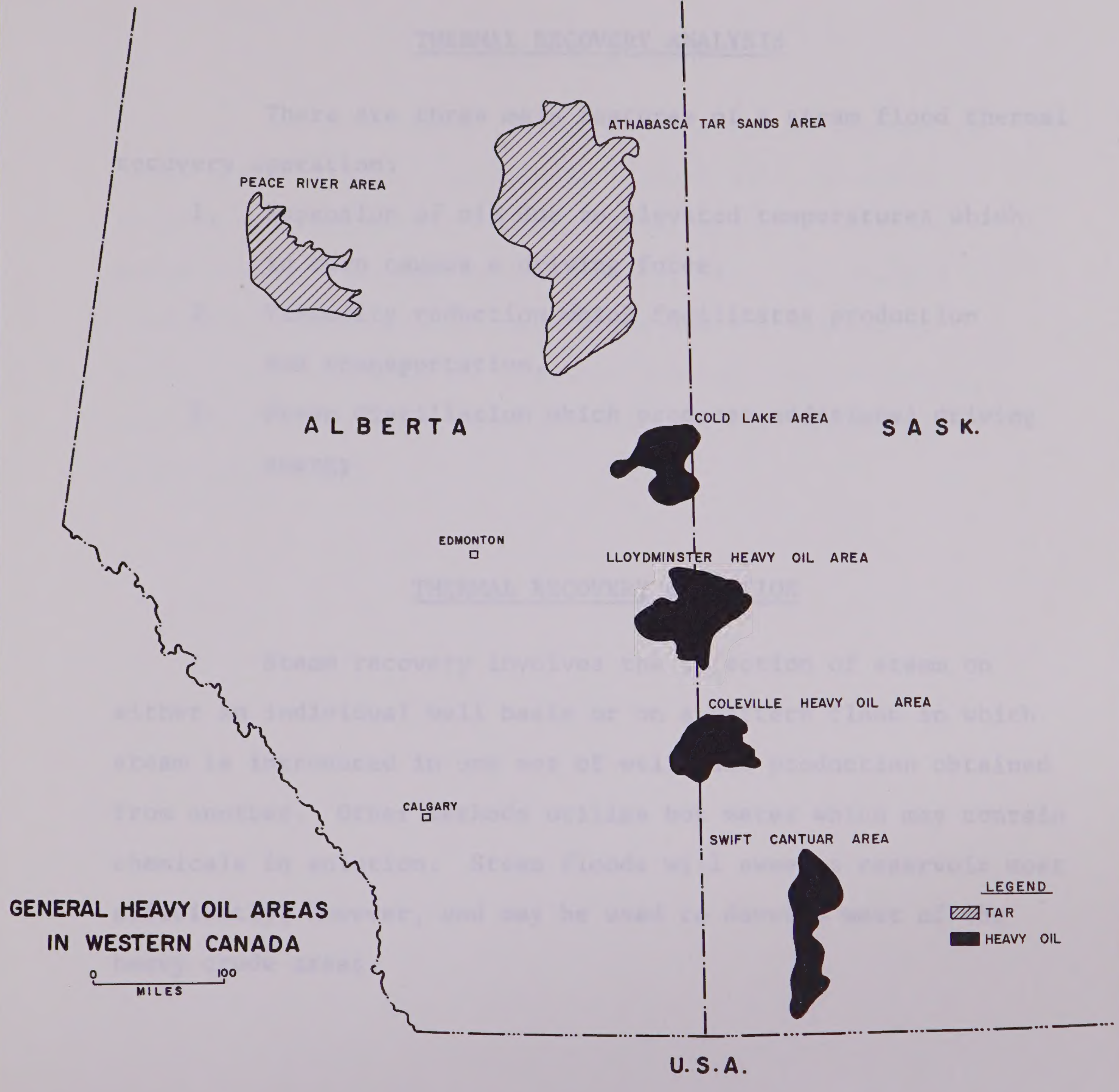

GENERAL HEAVY OIL AREAS IN WESTERN CANADA

THERMAL RECOVERY ANALYSIS

There are three main features of a steam flood thermal recovery operation:

1. Expansion of oil due to elevated temperatures which in turn causes a driving force.
2. Viscosity reduction which facilitates production and transportation.
3. Steam distillation which produces additional driving energy.

THERMAL RECOVERY OPERATION

Steam recovery involves the injection of steam on either an individual well basis or on a pattern flood in which steam is introduced in one set of wells and production obtained from another. Other methods utilize hot water which may contain chemicals in solution. Steam floods will sweep a reservoir most efficiently, however, and may be used to develop most of the heavy crude areas.

REFINING PROCESS

The processing operations selected to upgrade the heavy crude oils to a marketable product will include a thermal conversion unit; a hydro treating unit; hydrogen generation and sulphur recovery facilities. The thermal conversion facility will convert the heavy crude oil to a distillate suitable for pipeline process, the remaining low valued heavy pitch will be used as a fuel source for plant operations.

SHELL CANADA'S PEACE RIVER PROJECT

Shell's laboratory research program on methods of producing these petroleum reserves led to the discovery that certain solutions of synthetic detergent were capable of wetting, emulsifying and suspending the bitumen contained in samples of the sands. Further research revealed that heated, critically prepared solutions were even more efficient in emulsifying the heavy crudes. The selection of the specific methods and conditions for the upgrading of the heavy crude is based on previous research by Shell Canada.

It has been concluded that commercial production from the heavy crude formations by the injection of steam and aqueous solutions is feasible. In the planned commercial operations at Peace River, large quantities of injection fluids, water and steam must be handled and separated, refined and transported. These factors, in addition to the numerous unusual aspects of the production process make it imperative that the techniques and methods be gradually developed to full scale operation. This gradual development is necessary to acquire the degree of technical knowledge necessary to assure an efficient operation consistent with conservation.

The present installation at Peace River, has, therefore, been designed as the initial phase of Shell's in

situ thermal recovery process for commercial recovery of oil from the heavy crude formations.

Dept. of Municipal Affairs

G. A. ARNASON

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